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Abstract to the Presentation: Recent Work on Archival Color Spaces

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Recent Work on Archival Color Spaces

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Introduction

This talk will describe work and results obtained so far in connection with and related to CIE TC8-09, the CIE Division 8 Technical Committee on Archival Color Imaging. The Committee was formed “to recommend a set of techniques for the accurate capture, encoding and long-term preservation of colour descriptions of digital images that are either born digital or the result of digitizing 2D static physical objects, including documents, maps, photographic materials and paintings.” The committee’s members are mostly drawn from institutions which have an interest and stake in the committee’s outputs. These members are practitioners who are responsible for the capture, preservation, reproduction and distribution of images in digital and print format. Rather than a single technique that will cover all original types and capture scenarios, they want a risk-benefit analysis of the different options that will permit them to make an informed choice based on their particular mix of skills, budget, resources, materials and schedule.

The committee’s focus is on ingest and archiving and establishing common reference point across institutions for image capture and for the subsequent reproduction and distribution of images. A guiding principle is decoupling capture from reproduction (or ingest from dissemination), with the archived image serving as a common and institution-neutral starting point for subsequent channel-specific rendering decisions.

The committee distributed a questionnaire to its members that asked them, among other things, what topics in the areas of content, capture/digitization, quality and workflow would be useful to them and by implication for the committee to investigate [1]. The top three responses from a pre-compiled list of 19 topics were:

- Method to evaluate and validate the accuracy of images
- Parameters of “Archival” color space, e.g., primaries, gamut, white point, gamma correction, bit depth
- Making color space conversion and rendering intent part of this discussion

This talk will describe recent work on the first two, while noting that the third suggests that it is not entirely possible to divorce capture from rendering: so while people want to know how faithful their captured image is to the original, they also want pleasing pictures.

Comparison of Capture Techniques

This year participating institutions have been part of a study in which they captured seven test pieces: three standard targets and four color print originals [2]. The goal of the study was to assess the suitability of different overall color imaging and encoding

approaches for meeting an organization's goals. Using their existing protocols, each institution captured the seven pieces and generated TIFF files for them with color data encoded typically using sRGB, Adobe RGB, ProPhotoRGB or eciRGB v2. Participating institutions used digital cameras and planetary and flatbed scanners for capture, with manufacturer's or custom profiles and in some cases post-capture image processing. The captured values were then compared to the color values of the color patches on the targets and selected regions on the originals. The best agreement between captured and measured values was obtained with digital camera and custom profiles, and in general the agreement was better for the targets than for the originals. This was not surprising when calibration is based on the targets in the first place. These are preliminary results that continue to be refined as more institutions contribute results to the study.

Color Gamut and Accuracy

An enduring question is what color space to use for image archiving. The space should of course have a gamut large enough to contain all the colors it needs to cover but be no larger than necessary so that it is most efficient with the least possibility of quantization artifacts. In particular, is sRGB adequate? A study that sampled a wide range of cultural heritage materials found that it was with a few exceptions [3]. This initial study measured the color values of selected regions on about two dozen objects from the General, Prints & Photographs and Geography & Maps collections of the Library of Congress and plotted them on an a^*-b^* plot. The study also suggested that using reference colors for calibration and profiling that were more representative of the color content of the material being captured would improve color accuracy. This echoes a comment on the TC8-09 questionnaire that the most often used calibration targets have reference colors that are poor representations of those in the content being imaged.

References

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Author Notes

Robert Buckley is a Scientist at the University of Rochester and the founder of NewMarket Imaging, a consulting firm in cultural imaging. Steven Puglia is the Manager of Digital Conversion Services at the Library of Congress. Michael Stelmach, formerly with the Library of Congress, is now an independent consultant. F. Barry Wheeler is a Digital Projects Coordinator and Lei He is an Image Scientist; both are with the Library of Congress. Michael J. Bennett is Digital Projects Librarian & Institutional Repository Coordinator at the University of Connecticut.